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ABSTRACT

This report explains that there is growing evidence of a correlation between the adequacy of a school facility and student behavior and performance. In general, students attending school in newer, betterfacilities score 5 to 17 points higher on standardized tests than those attending in substandard buildings. School facility factors such as building age and condition, quality of maintenance, temperature, lighting, noise, color, and air quality canaffect student health, safety, sense of self, and psychological state. The report further explains that research has also shown that the quality of facilities influences citizen perceptions of schools and can serve as a point of communitypride and increased support for public education. Of special importance is the effect that facilities have on time inlearning, which is universally acknowledged as the single most critical classroom variable. Further, according to the most recent school infrastructure inventory by the Tennessee Advisory Commission on Intergovernmental Relations, 26 percent of the state's 1,590 K-12 schools are rated "fair," "poor," or "in need of replacement." However, almost half of allstate schools need some upgrading of facilities. The estimated total cost of these needed renovations, repairs, and replacements is $1.5 billion. (EV)

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Do K-12 School Facilities Affect Education Outcomes?

ED 479 494

Tennessee Advisory Commission on Intergovernmental Relations

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Staff Information Report

January 2003

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Do K-12 School Facilities Affect Education Outcomes?

A Staff Information Report

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Foreword

In 1988, more than half of Tennessee's school systems joined together and filed a lawsuit charging the state with failing to fund all systems, rich and poor, equitably, and in 1993, they won. In the meantime and after two years of deliberation, the Tennessee General Assembly adopted a new funding formula as part of the Education Improvement Act (EIA) of 1992. The plaintiffs were not entirely satisfied with that remedy and challenged it on three bases: it did not solve the problem of inequity among the systems in teachers' salaries, it should be funded immediately and not phased in over six years as the legislature planned, and it did not provide adequate funds to bring all school buildings up to modern standards.

The Tennessee Supreme Court agreed with the plaintiff school systems on only the first point and did not agree that more must be done to help poor school systems renovate or rebuild their schools. In fact, the formula increased funding for capital outlay dramatically. Before the EIA established the Basic Education Program (BEP) and a new state formula to support it, the state provided less than $12 million each year for capital outlay. The new formula includes a component that generates more than $380 million in state and local dollars based on the square footage required for the number of students each school system serves. The state takes responsibility for half that amount, and the other half is required of local school systems based on their county's ability to generate revenue for education. School systems have discretion to spend these funds for capital outlay or any other component of BEP; likewise, they can spend other non-classroom BEP funds, such as those generated for transportation, on capital outlay.

In the years since the BEP was implemented, school systems have increased spending for capital outlay dramatically. Many new schools have been built, and many more have been renovated. Nevertheless, school systems have reported a need for projects totaling more than $3.5 billion to build, upgrade or otherwise better equip their school buildings over the next five years—nearly $1.5 billion of that total is needed specifically for upgrades of existing facilities. This figure is comparable to one calculated by TACIR staff in 1997 based on a study by the U.S. Government Accounting Office (GAO). In 1996, the GAO estimated that fifty-six percent of Tennessee's schools had at least one inadequate building feature and sixty-four percent had at least one unsatisfactory environmental condition. Based on their information, we calculated a three-year cost of $1.7 billion for the period of 1994-97 to remedy those conditions.

In the context of school reform, it is appropriate to ask whether Tennessee should spend part of the relatively scarce resources we have available to us on upgrading school facilities. This report makes clear that it is necessary to ensure that those upgrades are directly related to things that make a difference in learning outcomes. We hope this report will be helpful in the evaluation of this issue.

Representative Randy Rinks
Chairman

Harry A. Green
Executive Director

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EXECUTIVE SUMMARY

There is growing evidence of a correlation between the adequacy of a school facility and student behavior and performance. Almost all of the studies conducted over the past three decades, including two in Tennessee, have found a statistically significant relationship between the condition of a school, or classroom, and student achievement. In general, students attending school in newer, better facilities score five to seventeen points higher on standardized tests than those attending in substandard buildings.

As far back as the 1920s, industrial research established the relationship between environmental factors and employee productivity and morale, but these lessons have not been applied widely in educational settings. In recent years, however, the importance of school facilities has been increasingly recognized. There are now eight states where the courts have explicitly made the funding of capital facilities a part of education equalization remedies.

School facility factors such as building age and condition, quality of maintenance, temperature, lighting, noise, color, and air quality can affect student health, safety, sense of self, and psychological state. Research has also shown that the quality of facilities influences citizen perceptions of schools and can serve as a point of community pride and increased support for public education.

Of special importance is the effect that facilities have on time in learning, which is universally acknowledged as the single most critical classroom variable. Every school year, many hours of precious and irreplaceable classroom time are lost due to lack of air conditioning, broken boilers, ventilation breakdowns, and other facilities-related problems. No one knows the extent of those occurrences in Tennessee.

According to the most recent school infrastructure inventory by the Tennessee Advisory Commission on Intergovernmental Relations, twenty-six percent of the state's 1,590 K-12 schools are rated "fair", "poor", or "in need of replacement". However, almost half of all schools need some upgrading of facilities. The estimated total cost of these needed renovations, repairs, and replacements is $1.5 billion.

Policymakers should be concerned about the relationship between school facilities and student learning and achievement, not only because of health, security, and psychological issues, but also because the failure to create and maintain optimum learning environments can undermine other efforts to reform education such as Tennessee's adoption of the Education Improvement Act in 1992.

School buildings are only a piece of the education reform puzzle, but they may be a more important piece than we have understood in the past.

The quality of the learning environment is known to affect teacher behavior and attitudes toward continuing to teach.

It is unreasonable to expect positive results from programs that have to operate in negative physical environments.

In 2001, school personnel rated the majority of their buildings good or better, but say half need upgrades estimated to cost a total of $1.5 billion statewide.

A 1996 GAO report estimated that more than half of Tennessee schools had one inadequate building feature and two-thirds had at least one unsatisfactory environmental condition.

I. Introduction

Can school buildings and classrooms actually have a substantive impact on the learning process that occurs within them? This is a question whose implications are too important to be ignored and one that has been the object of study in recent years not only by educators, but also by professionals in the fields of architecture, psychology, sociology, and ergonomics. These studies have been conducted in rural settings in North Dakota, Texas, Georgia, and Virginia and in urban schools in Washington, D.C., Baltimore, Syracuse, and Milwaukee. Two such studies were done in Tennessee.

The Commission has endeavored to find the answer to this question for several reasons:

- There is growing evidence of a correlation between the adequacy of a school facility and student learning.
- If facilities do affect the learning process and school administrators and policymakers are not taking this into account, it is possible that education dollars are not being spent as effectively as they could be.
- TACIR is committed to exploring the implications of its annual school infrastructure needs survey for education policy.
- In eight states, the adequacy of school facilities has become a component of education equalization court orders.
- The U.S. General Accounting Office estimates that up to fourteen million students go to school in unsafe buildings that are hazardous to their health. Some of these are in Tennessee.

A. Characteristics of High Performing Schools

An examination of the relationship between school facilities and student achievement cannot be done without examining first how learning occurs, and what factors facilitate or hinder learning. What makes a good school? What do schools with high achievement levels have in common? What do we know about optimal planned learning environments?

In the late 1960s and early 1970s, researchers concluded that, in general, public schools were ineffective and that family-related variables such as income, race, education, and occupation were the primary factors in explaining student academic achievement. The landmark Coleman Report, an early national study of public education, found that the relative affluence or poverty of students' families accounts for seventy percent of the differences in scholastic achievement and that differences in the level of school resources had little effect. Well up into the decade of the 90s, school-based research was still concluding that a school's rate of student poverty is the most important factor influencing student performance.

The problem with this finding, of course, is that educators have no control over the social and economic backgrounds of students. Teachers have to work with the students who are assigned to them and do the best they can to overcome these obstacles. Poverty of background may be the most important factor in learning, but it isn't the only factor, and no researcher has concluded that it is a factor that cannot be overcome, at least partially, by other inputs into the education process. So over the past few decades, a large body of

instructional and school effectiveness research has established the fact that these early claims were incorrect. Further, this later research has identified variables that, all or in part, are under the influence and control of the schools and that, when addressed properly, contribute to making schools more effective.

By universal agreement, the most important classroom variable is time. If research has established any relationship in education, it is that which exists between time and learning. Other factors (student-teacher interaction, teacher quality, and school leadership) can have a potential impact, but there are no within-school variables that have a direct impact on a child's learning other than time on task.

There is no shortage in the literature either of lists of widely accepted characteristics of effective schools. The items common to most are

- a high level of family and community involvement,
- an emphasis on basic skills,
- effective leadership,
- high expectations on the part of teachers and students,
- high levels of collaboration and communication,
- frequent monitoring of teaching and learning,
- focused professional development, and
- a supportive, safe, orderly, civil, and healthy learning environment.

One list that is of particular note stemmed from a study of the Saginaw, Michigan, schools that involved teachers and administrative staff in identifying the system's most pressing problems and priorities. The factor mentioned most often and ranked number one was "clean and orderly climate." Accordingly, that list of findings includes this item:

> ***"The effective school establishes a well-disciplined, secure, and wholesome learning environment, and maintains clean and orderly school buildings."***
>
> Claus and Girrbach

Most education research points to social factors as having more of an influence on learning than physical factors. The result is that physical factors are ignored in educational planning. Researchers may have overlooked the obvious. The "bottom line" to all reforms in education is improved academic achievement—usually as measured by math and reading scores on standardized tests. It is becoming more and more apparent that the learning environment itself has a positive or negative effect on education outcomes.

The socio-economic status of students, the most important external factor in learning, cannot be controlled. Time in learning, the most direct internal factor, can be controlled. Because the physical environment has an important influence on time in learning, and on other indirect, but significant, factors in the learning process, policymakers should consider a building-based change process for school improvement.

B. Effects of Physical Environments

> *"Obviously, the most important variables that influence how students learn come from the genes their parents impart to them and the home environment they create for their children. Then, in descending order, are variables such as natural surroundings and conditions beginning from the day of birth to the very day the student enters the school building . . . Only then can the building play any part in how students learn. Even if the variance the building environment can account for is slight, the important factor to remember is that there is a portion of the variance that then can be controlled through efforts of educators and design professionals."*
> *(Earthman and Lemasters, 1996.)*

The influence of the physical, "built" environment is often subtle, sustained, and quite difficult to measure with precision. But we all know from personal experience that settings do make a difference. Most people concede that their inner feelings upon entering a cathedral are different from the feelings they experience entering a cafeteria or a parking garage. For proof that the man-made environment does affect how we live and act within it one need only look to the business world. Commercial, retail, and entertainment industries spend billions of dollars annually to create mood or ambiance. They pay close attention to the formation of space because they know that it affects their profits. How many times have we judged the quality or appeal of a restaurant prior to sampling the cuisine? Individuals associate various feelings with their settings. The relationships among the actual, the experienced, and the perceived physical environments are a somewhat neglected, but nonetheless important, area of study.

Buildings, settings, and environments are accorded symbolic value by those who use them as well as by those who do not. Physical entities come to symbolize certain qualities, values, aspirations, and experiences for individuals. A school may symbolize opportunity, hope, stability, and a safe haven in a world of insecurity and transience or, to someone else, the school structure may symbolize failure and oppressive authority. The physical environment, however, rarely has direct unmediated impacts upon human health and well-being. It is the interaction of individual characteristics with physical features of the environment that we must examine to understand how environments—including schools—affect behavior.

As far back as the 1920s companies began to sponsor research into factors affecting the productivity of their employees. These early studies, then known as industrial psychology, and now as human factors engineering or ergonomics, were the first to establish the impact of the work environment or human activity. They showed that environmental improvements, such as lighting, ventilation, and space utilization, were related to greater productivity and higher employee satisfaction and morale.

Almost a half-century ago, the famous psychologist Abraham Maslow investigated the behavior of subjects in three different rooms: a "neutral" control room; a "beautiful" room; and an "ugly" room. Observations revealed that the subjects in the "ugly" room performed in measurable and different ways from the others. Maslow concluded that the "ugly" environment produced feelings of discontent, fatigue, and a desire to escape.

In 1966, Frederick Herzberg published his well-known "motivation-hygiene" theory of workers in industry. He found that tasks assigned to workers, if designed properly, formed what he called "motivators", or things that made the workers feel good. The effects were generally

long lasting. On the other hand, he found there were certain environmental (hygiene) factors that produced negative feelings toward work and general dissatisfaction. If these negative factors were allowed to persist, workers could become disinterested and passive, or even bitter and antagonistic toward the company. This theory has become well known to educators who study student motivation, and its insights can easily be applied to education.

Not long ago, health care research began to show a link between the hospital environment and patients' healing. Researchers found, for example, that patients in a room with a window that had a view of a tree recovered more quickly than patients in an identical room that had no window. If adults in a work environment, or even in a hospital, are affected to such an extent by their surroundings, then it is logical to assume that children in school are similarly affected by *their* environment. Indeed, parents in one state confided to researchers that they couldn't imagine working in an environment as dismal as the schools their children attended!

A study of working conditions in urban schools concluded that physical conditions do have direct positive and negative effects on teacher morale, a sense of personal safety, feelings of effectiveness in the classroom, and on the general learning environment. Building renovations in one district led teachers to feel a renewed sense of hope, of commitment, and a belief that district officials cared about what went on in that building. An improved physical environment affected the social climate of the school and that subsequently had a positive effect on learning.

Building a school is different from building an office building. The school building not only has to be functional and economical, it has to give a sense of self-worth to the student. It has to show the community's commitment to education. Indeed, schools send an important message: we value our children. The building can either say to students: "Tough it out and get by—we're not completely committed to your education;" or it can say: "You are a vital part of our community. We want you to feel safe, comfortable, challenged, inspired, proud—we believe in you and your future." The message that the school building sends is not lost on teachers, students, or the community at large.

Even elementary school-age children are aware of the physical attributes of a setting. One study showed that children aged nine to eleven were more likely than adults to identify untidy classrooms, dirty bathrooms, and school walls painted one color as physical attributes that made their school not welcoming. A student may assume that authority figures in a poorly maintained building will accept or expect a lower standard of behavior and scholastic effort, because squalor is both a fact and metaphor. It tells a child what we think he or she is worth.

That the effects of building and classroom condition have been given minimal attention in many high schools is evidenced in a survey that appeared in Family Weekly magazine in

August 1991. About 2,000 teens from across the nation were asked their opinions about various aspects of their schools. When ranking a list of factors in order of importance, thirty-three percent of the students placed "building maintenance and construction" as the number one item needing improvement. Parents responding to the same list ranked "lack of proper facilities" dead last. Their top priority was "controlling drugs and discipline". So while parents may think that physical facilities are satisfactory (most parents never visit their child's high school during classroom hours anyway), those who inhabit those facilities for up to seven hours a day think of them as "old, dirty, and looking like a jail."

School facilities also seem to symbolize something to the community. In national opinion polls about whether or not schools were good, the public appeared to associate the quality of the school, and the level of student achievement, with the quality of the school building. Policymakers should never underestimate the impact of "pride of place" on students or the community. An attractive school is a source of pride and generates good will for public education. For students, it inspires good conduct, increases academic achievement, and reduces vandalism.

It has been said that a good teacher can teach anywhere and that a willing student is capable of learning in spite of the setting. There may be some truth to that. The issue is, however, whether teachers teach as well or students learn as much as they could have in better surroundings. It is simply a fact that the school environment itself has a largely untapped potential as an active contributor to the learning process

Physical Characteristics of Schools That Directly or Indirectly Affect Learning

- External physical—building foundation and structure, exterior walls, roof, windows, age of building, maintenance, school grounds
- Internal physical—doors, floors, interior walls, ceiling, HVAC system, electrical and plumbing, lighting, maintenance, lockers, storage space
- Security and safety—security guards, weapons screening, ingress and egress, fire control/alarms/resistance, emergency lighting, school order and discipline
- Ambient environmental health—air circulation/ventilation, indoor air quality, radon, asbestos and lead paint, cleanliness, material safety (lab chemicals, cleaning supplies)
- Physical classroom—lighting, acoustical quality, internal/external noise, temperature control, design/arrangement
- Psychological—color schemes, graffiti, peeling paint, crumbling plaster, condition of restrooms, broken windows, privacy, size of school, sense of emotional well-being
- Instructional—teacher, principal, science lab, computers, access to library, curriculum, class size, time in learning

C. Facilities and Education Outcomes

School buildings are only a piece of the education reform puzzle, but there is a growing understanding that they may be a more important piece than we have understood in the past. The vast majority of students in the United States attend school in older buildings, many of which are approaching fifty years of age. These buildings do not, for the most part, have the essential components that have been found necessary for a good learning environment. As a result of this situation, research exploring the relationship between building condition and student performance is vitally important. After all, children spend up to 24,000 hours of their lives within the walls of a school building. That amounts to fifteen percent of a child's entire life up to age eighteen. It has been estimated that one of every five Americans spends at least part of every day in a school building.

No other type of public building is subject to the amount of wear and tear that schools are subject to. Schools have four times as many occupants per square foot as office buildings, and they contain a host of pollution sources including lab chemicals, cleaning supplies, chalk dust, and molds—not to mention the problems of asbestos and lead paint.

Historically, the assumption has been that as long as the basic physical requirements of the school building are met—minimum standards for classroom size, acoustics, lighting, heating and air conditioning—the child's learning depends in large part on pedagogical, psychological, and social variables. Actually, the research demonstrates that buildings are much more than mere preliminary requirements for the learning process. Factors that can affect learning are many and varied as illustrated by the list at left.

Any assessment of the effect of physical facilities on learning must begin with an understanding of what matters in the learning environment and what outcomes are sought. A general consensus has developed among both educators and those who study learning about what should and should not happen in schools. It is hard to argue with these lists:

Functional Characteristics of Schools

Desirable

1. Higher student scores on standardized math and reading tests
2. Less absenteeism
3. Higher graduation and promotion rates
4. Higher morale, more school spirit, motivation
5. Less turnover of teachers
6. Greater community pride in, and support for, schools
7. More parental involvement
8. More "time on task" in the classroom
9. Enhanced socialization of students
10. Fewer disciplinary problems and actions
11. Enhanced feeling of security and emotional well-being
12. Creation and maintenance of an optimal learning environment

Undesirable

1. Student absenteeism, truancy, and tardiness
2. Vandalism of school property/graffiti
3. Low scores on standardized math and reading tests
4. Higher dropout rate
5. High incidence of expulsions, suspensions, and other disciplinary actions
6. Class disruptions, rowdy behavior
7. Failure to improve student academic performance
8. Racial and ethnic incidents
9. Smoking, drinking, drug use
10. Weapons offenses
11. School violence/assaults
12. Over-utilization of substitute teachers

Over the past three decades many hundreds of studies have been conducted to ascertain the effect of the physical environment on education outcomes. Some studies have been statewide in scope; others have focused on only one or two schools. Some have examined dozens of potential variables, while others have concentrated on single factors such as lighting or noise. Some have looked at the condition of school buildings, while others have focused more on individual classrooms. Almost all of the studies have found a statistically significant relationship between the condition of a school or classroom and student behavior and achievement.

However, a few words of caution are in order. Carroll McGuffey, in his 1982 book on facilities, characterized the studies as a "mixed bag of study types and methodologies presenting diverse problems of sampling, measurement and statistical analysis." Some studies are simply more rigorous than others and use a larger population for data gathering. Also, only in a few cases can a direct causal relationship be established between a single variable and learning, or achievement. The vast majority of the research concludes that there is a statistical correlation between a specific variable and a desirable outcome. Indeed, there is a

strong implication from the entire body of research that the quality of facilities has more of an effect on factors such as student attitudes toward school, self-esteem, security, comfort, and pro-social behavior, which in turn affect learning and achievement. Nonetheless, the preponderance of the evidence shows a very close relationship between the physical environment and how well students and teachers perform in that environment. And to repeat an essential point, even if the variance the built environment can account for is slight, the important fact is that there is a portion of the variance that then can be controlled through efforts of educators and design professionals.

II. Research Findings

Two scholars have done comprehensive, non-overlapping compilations of research findings on the relationship of school facility condition to student achievement and behavior. In 1979, Carol Weinstein published a review of 141 published studies and twenty-one papers presented at professional conferences. Three years later, Carroll McGuffey completed another monumental review of the research, discussing ninety-seven published studies. These two syntheses of the body of knowledge in this field have been extremely useful to policymakers, school boards, and professionals who plan, build, maintain, and remodel school facilities. Following is a summary of research on specific quality factors and their effect on educational outcomes.

Facility Factors Correlated With Positive Educational Outcomes

Age of the Facility

- Students had higher achievement scores in newer facilities. Indeed, as the age of the facilities decreased, there was a corresponding increase in scores in mathematics, reading, and composition.
- There were fewer disciplinary incidents in newer facilities.
- Attendance records were better in the new facilities.
- Social climate factors perceived by students were considerably more favorable in a new school.

Condition of the Facility

- As the condition of the facility improved, achievement scores improved.
- Stimulating environments promoted positive attitudes in students.
- Higher student achievement was associated with schools with better science laboratories. Furthermore, attitudes toward the science classroom predicted science achievement.
- Higher student achievement was associated with well-maintained schools.

Thermal Factors

- Eight of nine studies found a significant relationship between the thermal environment of a classroom and student achievement and behavior.
- There was a consistent pattern of higher achievement in air-conditioned schools.
- Achievement was greater in facilities that allowed for individual preferences for heat.
- Excessive temperatures caused stress in students.
- Solar heating through glass is a major contributor to overheated classrooms.

Visual/Lighting

- There seemed to be a cause-effect relationship between the variables of color and light and students' blood pressures.
- Under some conditions, classrooms having fluorescent lighting without an ultra-violet component had higher absence rates. Classrooms with full-spectrum lighting with ultra-violet content had a significant positive effect on attendance and scholastic performance. In general, light with ultra-violet content appeared to improve student health.
- Light in the classroom seemed to have a positive effect on attendance rates.
- Studies over many years have associated better lighting with increased productivity in industrial settings.
- Light had a positive effect on achievement.
- Daylight in the classroom seemed to foster higher achievement.

Cities and States . . .

Washington, DC. Research examined the relationship among parental involvement, school building condition, and student achievement. In those schools where large numbers of parents were involved in the PTA who raised considerable funds for school purposes, the buildings were in better condition than where parents were less involved and less money was raised. Dollar increases in the PTA budget for a school were positively correlated with improvements on the scale of building condition.

Schools surveyed (fifty-two) were categorized as "poor," "fair," or "excellent." It was found that the condition of the building was statistically related to the academic achievement of the students. An improvement in average scores of 5.5 percentage points was noted for each categorical improvement in school condition. After controlling for other variables such as socio-economic background, the study concluded that student scores were lower in schools with poor building conditions, and that the scores declined predictably as the condition of the school declined.

Milwaukee, Wisconsin. This study used measures of the condition of 139 school buildings and student scores in math and reading for the 1996, 1997, and 1998 school years. These data were entered into analysis models that included other information about the characteristics of the students including racial and ethnic background, attendance, mobility, and the percentage of students eligible for free or reduced price lunches. The results of the analysis showed a positive relationship between facility condition and student achievement in two out of the three years studied. School conditions explained up to sixteen percent of the variation in math scores in 1996—a powerful connection. The researcher was surprised to conclude that after controlling for differences in student ability, measures of school facilities accounted for as much of the

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Color of the Indoor Facilities

- Higher student achievement was associated with schools with pastel painted walls.
- There seemed to be a cause-effect relationship between the variables of color and light and students' blood pressures.
- Relaxing shades of blue significantly reduce systolic diastolic blood pressure.
- Studies in industrial settings have unequivocally identified certain colors as contributing to increased productivity by workers.

External Noise

- Higher student achievement was associated with schools with less external noise.
- Outside noise caused students to be dissatisfied with their classrooms.
- Excessive noise caused stress in students.

. . . States and Cities

differences in test scores as family background, socio-economic status, school attendance and behavior.

Saginaw, Michigan. The Saginaw project was designed to identify, improve, and control the school variables that affect student learning. The researchers asked faculty and staff in thirty-one school buildings to list and prioritize factors for school improvement. Goals listed in each school building plan were attained at a seventy percent to one hundred percent level. The item ranked number one, which had the lowest attainment level, was "clean and orderly climate." During the five-year project, as improvements were made to raise the attainment level of that top priority, student achievement in both math and reading rose in the highest achievement category and dropped in the lowest achievement category.

Virginia. A 1993 study examined the relationship between building condition and student behavior and achievement in small rural high schools. Student scores on achievement tests, adjusted for socio-economic status, were up to five percentile points lower in buildings with lower quality ratings. Achievement appeared to be more directly related to cosmetic factors (paint, floor maintenance, furniture, school grounds) than structural ones. Poor achievement was associated with specific building condition factors such as lack of air conditioning, locker conditions, and noise. Oddly, the better quality schools had higher ratios of disciplinary incidents, expulsions, and suspensions than did schools with poorer conditions. The researcher theorized that this might be due to higher standards and expectations in the schools rated in better condition.

A 1996 study of large, urban high schools in Virginia used the same methodology that was

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Air Quality

- Substantial numbers of schools across the nation have inadequate ventilation systems.
- Poor air quality causes respiratory infections, aggravates allergies, and causes drowsiness and shorter attention spans.
- Tightly sealed buildings, allergy-triggering floor coverings, and toxic emissions from cleaning fluids, paints, and other frequently used substances are major contributors to indoor air pollution.
- When students do not feel well when they are in school, or miss school due to air quality problems, learning is adversely affected.

Factors studied that have not shown any correlation with student achievement include: amount of space per student (findings were mixed); windowless facilities (only one study); underground facilities; size of the school site; school building utilization; and support facilities (gymnasium, cafeteria, auditorium).

It is important to point out that some of the scholarly research on school facilities and student

Cities and States . . .

applied to the earlier rural study. The results were the same, but the range of differences between below standard and above standard buildings was much greater. This research found that student achievement was as much as eleven percentile points lower in substandard buildings.

Syracuse, New York. This study examined the effects of school renovations on student performance over a twelve-year period. Students in a school being renovated were tested before, during, and after the actual construction. The research found a statistically significant relationship between improvements in school buildings and math scores. Reading scores were not significantly correlated with facility condition. Researchers believe that an influx of non-English speaking students may have affected the reading results. The study also identified a correlation between improved academic performance and newer facilities. As might be expected, academic achievement declined during renovations, but recovered and improved following completion of construction.

North Dakota. In 1995, a statewide study of building condition and student achievement was conducted in all 199 high schools in the state. North Dakota was selected for this project because, traditionally, its students score among the highest in the nation on the Scholastic Aptitude Test and because the state has a relatively homogeneous population that is mostly rural. Principals were asked to rate their schools as "substandard," "standard," or "above standard" in three categories—structural, cosmetic, and overall. Building scores were then correlated with scores on a standard test administered to all students in the eleventh grade. In all but one sub-test, the students in above standard buildings outscored students in the substandard buildings by an average of five percentile points.

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performance has reached a negative conclusion. Although most scholars who have studied the question concur that achievement suffers in poor school environments, most are deeply skeptical about studies linking improved achievement with top-notch buildings. They point out that much of the work establishing such a linkage has been done by graduate students, and that many of the facility assessments were done by volunteers, or school officials, and may have lacked rigorous checklists. Some studies failed to control for critical variables such as teacher experience. Critics also point to anomalies in findings—correlations on math scores, but not reading scores or vice versa; three-year studies that found linkage in two years, but not in the third; one study in which disciplinary incidents were more common in a new school than in older ones; and the fact that some of the research has been commissioned or sponsored by groups of architects or facility planners—people who have a vested interest in proving a linkage.

They point to Kansas City, Missouri, where the school system spent about $700 million on facilities in an effort to desegregate the schools and improve student achievement. The effort failed, and in 2000 the district was facing a possible loss of state accreditation.

Several years ago the State of Arizona found it was one of only five states projected to have student enrollment increases of over twenty percent in the next decade. The legislature passed a statute creating an Arizona School Facilities Board and charged it with reviewing

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Tennessee. In 1988, two professors at East Tennessee State University investigated the differences in student achievement, health, attendance, and behavior between two groups of students in different physical environments in a rural county school system. Two elementary schools containing students between the ages of five and thirteen were selected. One school was recently opened and was a modern building in all respects. The other was constructed in 1939 and had had very little improvement to the physical structure. The students and faculty in both buildings were essentially the same. Students in the fourth and sixth grades were tested to ascertain their levels of academic achievement. Students in the new building significantly out performed students in the older building in reading, listening, language, and arithmetic. Further, faculty in the new building reported better attendance and fewer disciplinary incidents. Analyzed data revealed, in every case, that a significant difference existed between students at the two schools.

The Tennessee study was replicated in Georgia in 1997 with similar results. A definite relationship was established between the age of a school building and student scores on reading and math tests. In fact, math scores of students improved by 7.63 percentile points after moving from an old facility to a new one.

Baltimore, Maryland. An ambitious study of nine Baltimore schools focused not on single variable relationships to learning and achievement, but on the interactions among physical, social, behavioral, attitudinal and physiological factors. The research involved three distinct levels of school facility assessment: (1) building condition assessment (codes, regulations, structural, health, and safety); (2) educational adequacy assessment (how a building's characteristics hinder or promote basic educational activity); and (3)

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design differences between high performing schools and low performing schools. A consulting firm was hired to identify design variables affecting achievement. The study was conducted in 394 schools, representing 34,658 students, using existing Arizona Department of Education student data and additional facilities descriptors. The analysis examined thermal factors, classroom lighting, maintenance schedule, crowdedness, furniture, privacy, noise level, aesthetics, technology, color, interior decoration, and flooring. No relationships were found.

The Arizona study stated that it is possible for students to attend a substandard facility, but still learn and test well, if they have supportive parents, gifted teachers, and a high standards curriculum. Children without these advantages will not do well in school simply by virtue of attending school in a newly constructed or newly renovated building. However, the report noted that measurements for the design variables cited were confined to a small sample of schools. "Our findings do not determine whether or not these design features have an effect on student attitudes, productivity, and feelings about school; this analysis found only that

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environmental quality assessment (linkages between school facility performance in item 2 and various educational outcomes). The central question in this research was not what impact facilities have on student learning but, in each of the nine schools studied, what impact that facility had on those students' performances, and what needed to be improved about that facility to improve the performance of those students.

Assessments were made in the subject schools using a list of ten attributes of quality identified from the research literature. These factors, listed in order of importance, are:

1. Physical comfort and health
2. Classroom adaptability
3. Safety and security
4. Building functionality
5. Aesthetics and appearance
6. Personalization and ownership
7. Places for social interaction
8. Privacy
9. Sensory stimulation
10. Crowding/spaciousness

Physical comfort and health was the only item that showed strong linkages to student academic performance, student social development, and teacher instructional performance. Classroom adaptability and safety and security were strongly linked to two of the three educational outcomes and none of the other attributes was strongly linked to more than one outcome. For Baltimore schools, physical comfort and health in the school and classroom was found to be the *sine qua non* of learning.

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there were no significant relationships between these factors and scores on the Stanford 9." (Interactive, Inc. in their report on school facilities in Arizona.)

In the only nationwide study since the Coleman Report in 1966, a research scientist at the Educational Testing Service in Princeton, New Jersey, concluded in 1997 that there is no link between spending on school facilities and student achievement. Using a national sample of 14,000 fourth and eighth graders, scores on a national math test were compared against the amount spent on capital outlays—facility construction and maintenance—by their school districts. The research found that improvements in teacher-student ratios, expenditures on instruction, and expenditures on school district administration were positively associated with improvement in math scores, but that expenditures on facilities, expenditures to recruit highly educated teachers, and expenditures on school-level administration were not. The author concluded that equalizing resources without earmarking them for investments most conducive to increased achievements might result in more money being spent, but without producing the desired results, and policymakers should apply resources to inputs that do raise achievement levels.

III. Facilities and Time In Learning

Evidence from a Comprehensive Virginia Survey

In the face of such conflicting findings, what are policymakers to do about facilities? Although the preponderance of the evidence seems to lie on the positive side, some of the claims do seem to be extreme. The conclusion (Milwaukee) that facility condition may have a stronger effect on student performance than the combined influences of family background, socio-economic status, school attendance, and behavior, seems hyperbolic, to say the least. On the other hand, to study all the schools in a state (Arizona) and not find one facility-achievement relationship; or to say that the dollars spent on facilities have had no impact on student achievement, seems equally unbelievable.

We *know* intuitively that stiflingly hot classrooms, poor lighting, and excessive noise have a negative effect on the learning process. We *know* from industrial studies that environmental factors do affect human attitudes and behavior and can be used to produce desired outcomes. We *know* that attitudes, feelings of optimism, security, and self-worth affect behavior. But we also *know* that no building or school environment can entirely overcome the burdens that many students bring to the classroom.

To ignore what we know would be taking too big a chance on our children's future. If there is the slightest chance that failure to build, equip, remodel, repair, and maintain educational facilities may offset benefits derived from restructuring the instructional program, action should be taken to remove that possibility. According to the National Education Knowledge Industry Association, "School buildings are a tool in the enterprise called learning and, like any tool, they can help or hurt the enterprise. We can't control all the influences that affect a child's learning, but we can control the kinds of learning facilities to which we send our children."

Fortunately, aside from all the controversies over methodology and the complexities of regression analysis, policymakers have another resource in determining the importance of facilities to learning, achievement, and behavior. As stated earlier, the one paramount factor that all scholars agree on is that time in learning is the only within-school variable that directly impacts a child's education. When students are not in school, learning and achievement suffer.

Daniel Duke, with the Thomas Jefferson Center for Educational Design at the University of Virginia, has postulated that building condition affects many intervening variables, which, in turn, influence student learning. One of these variables, he suggests, is time on task. He asked the central question: How much instructional time is lost or compromised as a result of building-related problems? In an effort to understand better the connection between facilities and learning and teaching, the Thomas Jefferson Center was commissioned to do a survey of that state's school systems in 1998. This study is perhaps the most important one conducted anywhere because it focused on practical, down to earth, everyday building factors that impact the quintessential learning variable—time. The survey was designed to secure inputs in five areas of concern. Some ninety-six percent of the state's school systems responded, and the results are summarized here:

1. **Instructional time lost because of problems related to facilities.**

Thirty-six percent of the systems were forced to close one or more schools during the 1997 and 1998 school years because of problems related to school facilities. Lost time ranged from early dismissals due to a lack of air conditioning to ten days without classes because of a heating system failure. Schools were dismissed early on at least forty-four occasions, and some ninety-four days of instruction were lost. In one case, due to extreme heat and no air conditioning, every school in one system had to be closed. Tens of thousands of students were affected. It was pointed out that these statistics do not include warm days or cold days when schools remained open, but students and teachers were unable to function effectively. Problems with ventilation, electrical systems, and water and sewer facilities also resulted in lost instructional time. The costs of deferred maintenance extend beyond the cost of plumbing repairs and boilers—the students within the school system are being affected as well.

2. **Reduced effectiveness of teaching and learning due to facilities.**

Insufficient classroom space compelled fifty-three percent of the systems to increase class sizes in spite of pupil-teacher ratio requirements. It was found that sixty-three percent of respondents held classes in spaces not designed for instructional purposes—auditoriums, cafeterias, storage areas, hallways, teacher workrooms, locker rooms, and in two cases, converted coal bins. More than forty percent of the systems had had to combine classes, forcing teachers to handle two preparations simultaneously and even to share the same classroom space at the same time. About two-thirds of the systems were using mobile classrooms without running water or wiring for computers. Inadequate facilities such as these obviously have negative impacts on teachers and students.

3. **Diminished curricular options.**

Twenty percent of the Virginia systems reported canceling or eliminating courses because of facility limitations. In another sixteen percent, access to certain courses and programs had to be limited. Programs most affected by these restrictions were vocational education, kindergarten, alternative education, and computer courses.

4. **Pressure on facilities resulting from state and federal mandates.**

Constitutionally, education is the state's responsibility, whereas school facilities are usually the local district's responsibility. State and federal mandates for educational programs and environmental safety are almost never accompanied by funds needed to implement them. These mandates impose a real financial burden on local systems. When schools are built, they are designed to accommodate educational programs that meet existing expectations. In later years problems arise when new demands are imposed. Almost a quarter of a century after passage of federal legislation, some Virginia school facilities still do not meet building standards for students with disabilities. Seventy-two percent of the systems reported the need for new facilities to comply with new educational accountability mandates in such areas as computer instruction, science laboratories, reduced class sizes, and tutorial and special education rooms.

5. **Student health and safety issues related to facilities.**

   Seven percent of the school systems reported that facilities-related problems had resulted in injuries to students and student absenteeism. One student fell through a rotten section of flooring. Others experienced allergies and problems related to poor ventilation. Seventeen percent of the respondents said that parents had withdrawn students from school because of problems with facilities.

It does not seem reasonable to conclude after reading the results of the Virginia survey that teaching and learning are unaffected by such conditions. If facility problems such as these exist in Virginia, they exist in other states also. One simply cannot ignore the connection between what students learn and where they learn.

There are two aspects of the relationship between facilities and time in learning. The Virginia survey reveals the negative side of time lost. The positive side is the more effective use of instructional time when facilities are adequate. Researchers studying the youngest children entering renovated schools noted that teachers in those schools had changed their instructional techniques because the buildings could now accommodate them. Reading and math scores showed an increase. It can take time for the impact of improved facilities to be manifested in higher achievement, but better teaching should become apparent almost immediately.

After moving into a new building, a principal remarked that the teachers no longer had to "fight the environment". This is, perhaps, the most telling description that one could have about the effect of a facility on teaching. School faculty and administrators in most systems work constantly to improve the effectiveness of instructional time. It is the responsibility of policymakers to make sure that as many factors as possible that detract from instructional time are eliminated from the school and classroom environment.

IV. School Facilities Litigation

Because public education is financed substantially through local property taxes, large inequalities between rich and poor systems have developed over the years. The goal of the school finance equalization movement has been to use state and federal funding to reduce those inequalities by channeling more resources to poorer districts. The first equalization case (unsuccessful) was in Indiana in 1859. More than a century later, the floodgates of school finance litigation were thrown open by a California case, Serrano v. Priest (1971), in which the court held that school spending disparities were contrary to the state's "fundamental interest" in education. Two years later, in San Antonio Independent School District v. Rodriquez (1973), the U.S. Supreme Court held that education was not a constitutional right and that spending equalization was a state matter. Over the next decade lawsuits similar to Serrano were filed in virtually every state. By 1997, 40 states were either under court-ordered equalization or still had litigation pending or on appeal.

These lawsuits have, historically, focused on variations in per pupil expenditures among a state's school districts. In some states, however, inadequate school facilities were pivotal elements in court rulings that found funding mechanisms unconstitutional. Court decisions in those states found that "adequacy," "thoroughness," or whatever constitutional language applied, required that children be educated in safe and decent facilities, which was usually defined as those that are "structurally safe, contain fire safety measures, sufficient exits, an adequate and safe water supply, an adequate sewage disposal system, sufficient and sanitary toilet facilities and plumbing fixtures, adequate storage space, adequate light, be in good repair and attractively painted, as well as contain acoustics or noise control."

In 1994, Arizona became the first state to have its school funding system declared unconstitutional due to the condition of school facilities. As of June 2002, a total of eight states have had statutes struck down because they did not provide sufficient dollars for meeting facilities needs. The significance of these cases (see next page) is that the highest courts in eight states have found school facilities to be so essential to the constitutional requirements for education in their states, that they have been made an integral part of court-ordered equalization. Furthermore, although some briefs by plaintiffs may have included references to research findings on the relationship between facilities and learning, not one of the court opinions cited such research as a basis for including facilities in equalization orders.

Tennessee's Office of Research and Education Accountability, in a September 2002 report called *School Capital Funding: Tennessee in a National Context*, identifies a total of seventeen states that have changed their capital finance programs as a result of lawsuits. Even in states where capital spending wasn't the primary issue, and even where courts ruled against the plaintiffs, there is such widespread recognition of the importance of facilities that legislatures have acted unilaterally to enhance the adequacy and equity of capital funding.

Various studies have shown that students in inadequate school buildings perform between five and seventeen points lower than their counterparts in nicer facilities. This puts them at a terrible disadvantage—some believe a legally remediable disadvantage. One scholar has likened facilities disparities to the "separate but equal" doctrine that was struck down by the U.S. Supreme Court in Brown v. Topeka Board of Education (1954). Few would argue that those segregated facilities were truly equal. Many, if not most, minority students attended schools that were old, poorly maintained, under-funded and inadequate by any standard. They were assigned to those schools because of their race, and the U.S. Supreme Court

declared that unconstitutional. Today, particularly in inner city schools, there is still *de facto* segregation because of housing patterns and disparities of wealth. Minority and poor students in those schools are still disadvantaged. But even if those having to attend substandard and unsafe schools weren't poor or minority, the question remains whether *any* child should be subjected to such conditions.

Another potential legal development arises from the research showing achievement disparities between students in substandard facilities and those in newer and better facilities. To date, all the state equalization cases have involved disparities and inequalities among school districts within a state based upon the property wealth of the district. But what about differences *within* a district? It is possible to have an adequate school in a poor district or an inadequate school in a wealthy district. If a child is truly affected in learning by the school environment, is attendance in a substandard school any less injurious to that child because the district itself is relatively advantaged?

Such matters are now left to districts, just as the Rodriguez decision left equalization up to the states. In 1896, the U.S. Supreme Court, in Plessy v. Ferguson gave the legal stamp of approval for the "separate but equal" doctrine of racial segregation. The Plessy case was overturned by Brown in 1954. Inequalities still exist in education spending and in school facilities. Plaintiffs have not prevailed in every state, and judicial remedies have not always eliminated all the disparities. The primacy of moral and constitutional issues notwithstanding, it was unequal facilities that led to the Brown decision. Unequal facilities may well be the catalyst for revisiting San Antonio Independent School District v. Rodriguez.

Litigation in Other States

Arizona. In 1991, over forty poor school districts filed a suit alleging that the capital funding portion of the education finance system violated the uniformity requirements of the state constitution's education clause. In 1994, the Arizona Supreme Court agreed, concluding that the funding scheme did not enable all districts to provide the facilities and equipment necessary to allow their students to meet competency standards and other state-mandated requirements. The legislature responded by repealing local property taxes that had been used to support capital expenditures and making capital funding a state responsibility. Special funds were established for correcting school facility deficiencies, renovating and repairing buildings and equipment, and for new school construction. A new School Facilities Board was established to assess the condition of all school facilities in the state, formulate building adequacy standards, and to manage the three funds. Voters approved an increase in the state sales tax from 5.0 percent to 5.6 percent, with the extra revenues earmarked for the capital programs administered by the Board.

Alaska. In 1997, plaintiffs filed suit, claiming that the state's method of funding capital projects for education violated the Constitution and Title VI of the Civil Rights Act of 1964. The Superior Court held for the plaintiffs in its 1999 decision and rejected state's 2001 appeal. The legislature, for the first time, allocated significant funds for construction and renovation of rural schools for fiscal year 2000-01, but has not yet changed the dual state/local system of financing facilities. The March 2001 decision regarding the state's appeal was not a final one, and a final decision is anticipated before the end of 2002.

Colorado. In 1998 litigation was filed over whether the deteriorating physical state of the public schools deprived students of

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educational opportunity. In June of 2000 the trial court judge approved a settlement whereby the state agreed to commit $190 million to fund school repair and construction in the poorest school districts over the next decade. Legislation was passed to implement this settlement, and in November of 2000, voters approved a referendum requiring the legislature to increase spending on public schools by at least the rate of inflation, plus one percent, each year for the next ten years, and by the rate of inflation thereafter.

Idaho. Equalization plaintiffs have not had an easy time in Idaho. Several challenges under the "equal protection" provisions of the state constitution have been rejected over the past quarter-century. Plaintiffs lost again in 1997, but the state Supreme Court reversed and remanded that portion of the case relating to facilities and capital funding. The court held that "the legislature has a duty to provide a means for school districts to fund facilities that offer a safe environment conducive to learning." In 2000, the legislature passed a school building safety act and established a revolving loan fund for school safety and health needs. However in 2001, a trial court ruled that loans alone do not fulfill the constitutional requirement for a sufficient means to fund facilities, because Idaho's poorer districts do not have the fiscal capacity to repay loans. The state is appealing that decision, but in the meanwhile, legislation has been signed into law that helps districts, on a sliding scale according to wealth, pay the interest portion of their loans.

New Jersey. In New Jersey, disparities between poor districts (mostly urban) and wealthy districts (mostly suburban) were striking. In a series of cases involving seven separate court rulings over more than a decade, the state Supreme Court declared that the constitutional requirement for a "thorough and efficient" education includes the following: an education based on core curriculum content standards; school funding at the spending level of successful school districts (parity funding); intensive preschool and other supplemental programs to eliminate disadvantages; and educationally adequate school facilities. The Court added that the quality of the facilities cannot depend upon a district's willingness or ability to raise taxes or incur debt. The Court also ordered the state's Department of Education to assess the condition of schools in the thirty plaintiff districts, develop standards and specifications for school buildings and facilities, devise a funding formula for state aid for school facilities, assist districts with long-range facilities plans, and ascertain that school facilities are regularly and adequately maintained as a condition for continuation of state aid.

In 1998, in a related case, the Court found that the constitutional guarantee of a "thorough and efficient" education included the right of students to attend a safe and secure school. Districts were required to develop programs to ensure safety in schools based upon the particular needs of each school. Taken as a whole, the New Jersey cases probably constitute the most comprehensive set of educational rights for disadvantaged school children in the nation, and adequate facilities are among those rights.

New Mexico. Like a large number of states across the nation, the state of New Mexico had an education finance equity lawsuit filed against it in the 1970s. However, this case was settled before it came to trial. The state agreed to fund all operations costs of public education and to provide essentially equal resources to each district. As a result of the settlement, New Mexico assumed eighty percent of all the cost of education—second only to Hawaii. However, local districts continued to have the primary responsibility for capital funding. A suit was filed in 1998 claiming inequity in the funding system for capital items. The trial court found for the plaintiffs and ordered the state to establish and implement a uniform funding system for

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capital improvements and for correcting past inequities. The legislature, in 2001, established a standards-based capital funding system for school districts and appropriated $400 million to fund it.

Ohio. Ohio was one of the earliest states to experience equalization litigation. In a 1923 case, the state Supreme Court ruled that the constitutional requirement for a "thorough and efficient" education for each child could not be met in any district that was starved for funds, or lacked teachers, buildings, or equipment. In 1989 the General Assembly directed that a survey be made of the state's school buildings to determine the cost of bringing all facilities into compliance with state building codes, asbestos removal requirements, and other state and local provisions related to health and safety.

In 1991, a suit was filed alleging that poor school districts were receiving such insufficient funding that students were being deprived of education opportunity. In a 1997 decision, the Court ruled that the state's education finance system was unconstitutional. The decision declared that the meager funding for capital improvements failed to meet the needs of districts with low property values and that the Constitution required facilities in good repair and the supplies, materials, and funds necessary to maintain those facilities in a safe manner, in compliance with all local, state, and federal mandates. Subsequently, considerable controversy has arisen over the method for determining funding adequacy for each school district, and the case has been reset on the state Supreme Court docket.

Wyoming. The Wyoming Supreme Court in 1980, and again in 1995, ruled that the state's school funding system was unconstitutional. In the 1995 action, the Court directed the legislature to determine the cost of a quality education and fund it. As a part of the response to that directive, an assessment of some 1,221 school buildings was commissioned to determine building condition, education suitability, and technology readiness. Buildings were scored on structure; exterior walls; roofs, windows and doors; floors; interior walls; ceilings, electrical, plumbing, HVAC systems; lighting; and fire safety factors. Points were assigned based on specific criteria, and ratings were totaled as follows: 90+ was new or as new; 70-89 was good; 50-69 was fair; 30-49 was poor; and below 30 was unsatisfactory. The average condition score of all school facilities was 73.25.

This survey figured prominently in the outcome in Wyoming. When the Court reviewed the legislature's response to its decision, it found that all aspects of the new funding system met constitutional requirements except for capital funding. Only nineteen percent of the buildings had scored ninety percent or higher. The Court established ninety percent as the standard for all Wyoming schools and ordered remedial action be taken to mitigate facility deficiencies and bring them all up to the ninety percent mark.

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V. K-12 Facilities in Tennessee

What are the implications of this research for Tennessee? What is the condition of our state's K-12 school facilities? In 1996, the U.S. General Accounting Office surveyed the nation's schools as part of a major study for Congress. A state-by-state tabulation of schools with inadequate building features showed the following percentages for Tennessee: HVAC—35.7 percent; electrical power—18.5 percent; lighting—15.6 percent; life safety code features—21.4 percent; roofs—21.5 percent; exterior walls, windows and doors—12.6 percent; interior finishes—11.1 percent; and plumbing—21.0 percent.

In the same year that the GAO survey was done, the Tennessee General Assembly enacted legislation to compile and maintain annually an inventory of needed public infrastructure within the state. This responsibility was assigned to the Tennessee Advisory Commission on Intergovernmental Relations (TACIR). One major section of the TACIR report is devoted exclusively to K-12 school facilities. A summary of the most recent survey appears at right.

- A school system's need for infrastructure investments and improvements results from growth in student populations, compliance with lower class size standards, actual wear and tear, neglect, age of the structure, state and federal mandates, and new technology.
- Seventy-four percent of Tennessee's public schools are rated in good or excellent condition, and 26 percent are rated poor, or fair, or in need of replacement.
- Forty-seven percent of all 1,590 public schools in Tennessee need to upgrade one or more facility components at an estimated cost of $1.5 billion.
- The total infrastructure needs for the state's K-12 schools over the 2002-2006 period is $3.6 billion.

Building Tennessee's Tomorrow 2002 (TACIR)

At the present time, as in most states, capital spending in Tennessee is primarily the responsibility of local districts and is usually accomplished through the issuance of school bonds or capital outlay notes. Poor systems (such as the plaintiff systems in Tennessee Small School Systems v. McWherter) are at a disadvantage in raising capital funds. Because many of them have neither high sales tax collections nor property wealth, they cannot afford to borrow as much as wealthier districts and have to pay higher interest rates when they do.

When it comes to reforming the education system, one size does not fit all. Because education has been held not to be a fundamental right under the federal Constitution, states have grappled with education equalization according to their own constitutions, based on their own values, traditions, and resources. Equalization of capital funding for facilities, which has long been primarily a local responsibility, is much more complicated and potentially much more expensive. Only eight states to date have confronted directly the equalization of spending for facilities, but many others are providing various types of assistance to public school systems. The range of state actions is interesting and impressive. Should Tennessee policymakers determine that a greater state involvement in school facilities is needed, they will have many alternatives from which to choose.

Several states (Arizona, Wyoming) have hired outside consultants to evaluate the condition of all school buildings. In many cases, such evaluations are being conducted now by school personnel or even volunteers. Having outside experts do the surveys brings to the task greater experience and expertise, more objectivity, and an increased level of standardization. Indeed, in the states mentioned, the evaluations have been used to establish uniform statewide standards for school facilities and for making long-term policy decisions.

About a fourth of the states have established school facility planning divisions in their state education departments. These units help school systems with facility planning, site acquisition, construction and design, capital funding, and facility management (including maintenance), and they provide other technical assistance. A few states require local school systems to formulate long-range facility improvement and replacement plans, and the state agency compiles those plans and administers that process.

Experience across the nation has shown that when school budgets get tight, the common reaction is to defer maintenance. A few states now earmark a portion of education appropriations for maintenance and prohibit transfer of those monies to other items. If the learning environment is as important as the research indicates, it is ironic that deferred maintenance may be undermining the very curriculum, pedagogical, testing and other reforms that legislatures have instituted to promote learning, raise student achievement scores, and assure accountability. State oversight of school building maintenance may have the appearance of micromanagement, but it protects the public capital investment that school facilities represent and assures that substandard learning environments do not negate the billions of dollars being appropriated to improve the quality of public education.

Changes in Tennessee

In Tennessee, as in the majority of states, the equalization of spending for education has been precipitated by the judicial branch. The legislative response here was the Education Improvement Act and the Basic Education Program (BEP) funding formula, which includes a capital funding component. Other states, however, (New Jersey, New Mexico) had similar statutory mechanisms that the courts struck down as inadequate or too dependent on the local system's ability to pay.

This year (2002) marks the 10th anniversary of the passage of Tennessee's Education Improvement Act. At this milestone, policymakers might consider taking a more detailed look at how that legislation is working. Much of the monitoring to date has focused on accountability—testing and achievement scores—to the exclusion of other related and vitally important issues addressed in this report. In Tennessee how much time in learning is being lost because of inadequate facilities? Virginia found some significant problems when it studied this relationship. Is the capital funding component of the BEP adequate to bring the facilities of poorer districts up to standard, or is the money being spread too thinly? What is "standard"? Could Tennessee be doing a better job of assisting school systems with their capital funding?

In its recent report on school capital funding, the Office of Research and Education Accountability cited three weaknesses in Tennessee's current funding program:

- The BEP capital outlay component does not adjust for rapid enrollment growth.
- Some districts lack the tax base to meet needs not funded by the BEP.
- The state has no mechanism to help LEAs reduce their borrowing costs.

Has the time arrived to implement the statutory authorization for local systems to secure capital funds through the Tennessee State School Bond Authority? To what extent are BEP funds being spent on facility factors that are positively correlated with learning and achievement?

Finally, does the state need to focus more attention on the management side of public education? State departments and agencies are subject to performance audits as well as financial audits. Most private enterprise audits include a management letter that addresses operational problems and makes recommendations for improving efficiency. The Texas comptroller's office has an extensive program that does this for local school systems. The program, which examines district organization and management, personnel, asset and risk management, purchasing, food services, transportation, safety and security, and computers and technology, has not only improved administrative efficiency, saving hundreds of millions of dollars, it has increased public confidence in the schools. Some of the larger systems in Tennessee, such as Davidson County, have such management audits and all school systems would benefit from them. Tennessee's Office of Education Accountability, established by the Education Improvement Act, has the statutory authority to review management practices of school systems, and recently conducted limited performance reviews of systems with schools on notice. With little more than half a dozen staff focusing on education issues and 138 school systems to review, however, it is not staffed for a comprehensive performance audit function.

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